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The subject matter of the Chapter II amended claims is revised to conform with the United States claim format and entered as new claims 25-48. Please consider these new claims when considering this application.

Respectfully submitted,


Michael J. Bujold, Reg. No. 32,018
Customer No. 020210
Davis & Bujold, P.L.L.C.
Fourth Floor
500 North Commercial Street
Manchester NH 03101-1151
Telephone 603-624-9220
Facsimile 603-624-9229
E-mail: patent@davisandbujold.com

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[010] This purpose is achieved in accord with the invention by the features of Claim 1. Embodiments of the concept of the invention are described and explained as objects of the subordinate claims.

[012] For the purpose of cooling the machine, the heat generated by its operation must be transferred to a cooling medium. The medium must be easily transportable to the individual machine. Air is an advantageous cooling medium which itself, after such use, can be again cooled or exchanged for free air. Air is an excellent insulator, on its account, so that in an electrical machine, no special insulation means need be called upon in order to protect the various components of the machine against short circuit problems, which could arise from the characteristics of notice cooling medium. In order to conduct the cooling medium into the machine safely, possible flow restrictions must be avoided in every possible way.

[014] In yet another advantageous embodiment, means are provided between the rotor shaft and the interposed shaft, i.e. the rotor laminate pack, to transport the

[020] In a further favorable embodiment, a heat exchanger is integrated into the electrical machine. The heat exchanger can have cooling tubes, which surround the stator and said cooling tubes can communicate, in a heat transfer manner, with provided cooling ribs. Cooling tubes can be provided directly within cooling ribs, which, with the cooling tubes which surround the stator, are inter-connectable. These cooling tubes embedded in the cooling ribs can, in one version, be installed at an angle to the cooling tubes which surround the stator. One embodiment shows the cooling ribs placed in a separate construction component, which can be mounted in the form of a cooling basin to the electrical machine.

[021] A preferred version employs air as the cooling medium.

[022] BRIEF DESCRIPTION OF THE DRAWINGS

[023] The invention will be explained and described in greater detail with the help of the drawings in which:

[024] Fig. 1 is an electrical machine with a star shaped, webbed shaft,

[025] Fig. 2 is a cross-section through a webbed shaft an rotor shaft as in Fig. 1,

[026] Fig. 3 is a cross-section through the heat exchanger, as in Fig. 1,

[027] Fig. 4 is an electrical machine with a shaft having sickle shaped internal webs,

[028] Fig. 5 is a cross-section through a webbed shaft and rotor laminate pack of Fig. 4,

[029] Fig. 6 is an electrical machine with a ventilating apparatus in the rotor shaft,

[030] Fig. 7 is a cross-section through the webbed shaft and the rotor shaft of Fig. 6,

[031] Fig. 8 is an electrical machine with a webbing arranged as an internal screw coil,

[032] Fig. 9 is a cross-section through a heat exchanger which possesses a cooling basin,

[033] Fig. 10 is a further cross-section through a heat exchanger with a cooling basin,

[034] Fig. 11 is a cross-section through the cooling basin in accord with Fig. 9,
and

[035] Fig. 12 is a cross-section through the cooling basin in accord with Fig. 10.

[036] DETAILED DESCRIPTION OF THE INVENTION

[037] Fig. 1 shows an electric machine 2 with a rotor shaft 4, which rotates on two sets of bearings, namely 6 and 8, which are enclosed in a housing 10. The rotor shaft 4 possesses a toothed end 11, proximal to the bearing, by means of which the electrical machine 2 coacts with additional (not shown) elements of a line of drive mechanism. A rotor, a stator laminated pack 12, through which a stator winding 14 penetrates is placed in the housing 10. A rotor laminate pack 18, separated by a spacer opening 16, is situated radially within said stator laminate pack 12. The rotor laminate pack 18 is penetrated by metal pins 20, which preferably are made of aluminum. A cap 24 is fastened onto the rotor laminate pack 18 with screws 22. As an alternative, the metal pins 20 can be embedded in the rotor laminate pack 18 in a precision molding operation. The rotor laminate pack 18 is seated on a hollow interposed shaft 26, circular in cross section. The rotor shaft 4 is placed with said interposed shaft 26 by press a fit, so that it rotates as one with the interposed shaft 26. The rotor shaft can, however, be press fit directly into the rotor laminate pack. The rotor shaft 4 possesses four webs 28, which are arranged in the shape of a star (see Fig. 2). The webs 28, in the embodiment depicted here, provide open spaces 29, so that the webs 28 do not lie along their entire length against the inner wall of the hollow interposed shaft 26. In the empty spaces 30, a first cooling medium, preferably air, can be circulated through the interposed shaft 26 between the webs 28, that is, for cooling the connected rotor laminate pack 18 thereto. For this purpose, a ventilating fan 32, which brings about a flow of the cooling medium, is placed on an axial end of the rotor laminate pack 18. A steel ring sheet 34, which directs the cooling medium flowing through a heat exchanger 36 in the direction of the interposed shaft 26, without turbulence, is provided on the other axial end of the rotor laminate pack 18. The heat exchanger 36 possesses cooling ribs 38 (see Fig. 3) through which the